

THE
Malayan Agricultural Journal.

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EDITORIAL.

**The Vegetable Oil
Crops in Malaya.**

The two important vegetable oil crops in Malaya are coconuts and oil palms. The products of the former are largely used by Asiatics in this country in their dietary, as an illuminant, and in other ways. The surplus, which is considerable, is exported as copra or coconut oil together with the by-product of the oil industry, "poonac" or coconut cake. Rather more than three-quarters of the area is in small holdings owned by Asiatics. Oil palms are nowhere in Malaya grown commercially as a small-holdings crop; the total area is contained on extensive holdings, and the products, oil and kernels, prepared for market in modern and well-equipped factories.

We include in this issue of the Journal a review of the position of these two industries in Malaya during the year 1939, together with an account of recent investigations of the Department.

So far as Malaya is concerned, the war has hit both of these industries a very hard blow, particularly as the principal markets for their products were in Europe. It would appear, therefore, that until the time comes for the European markets to be re-established, or unless new markets and new uses can be found, we must anticipate considerable difficulty in the disposal of these products.

The obvious line of approach to the problem of disposal of crops is to increase local consumption. It is certainly desirable at the present juncture that every effort should be made to do so, especially if they are used as substitutes for other imported products. This line of approach has been given serious attention, and we propose to discuss this subject at greater length in a future number.

Difficult as is the present position in the coconut industry we are of opinion that it would have been very much worse but for the growth during recent years of the local industry of preparing and exporting oil instead of copra. We are aware that this may be cold comfort for those who are faced at present with an unremunerative crop, but we mention it because we feel that further developments in this direction are possible.

With reference to the oil palm industry, medical authorities have shown that the red palm oil may be used in place of the more expensive cod-liver oil as a source of Vitamin A. Following up a report concerning nutritional problems in India to which our attention was drawn, we have succeeded in interesting the Indian Government in red palm oil. In the first place small samples of oil were submitted, followed at the request of the Indian medical authorities by a larger sample. This has resulted in the first bulk order. Confident as we are in the quality of Malayan oil we feel certain that a market may be established in India, and there is reason to believe that nutritional problems in certain other countries may be met in a similar way.

Looking further ahead, the Department is investigating the question of variable bleachability of palm oil with the object of ensuring a standard product. In another direction an examination is being made of the possibility of finding new markets for the liquid and solid fractions of palm oil, and new markets for the now almost unsaleable kernels.

It is possible that any or all of these new avenues may result in few if any permanent new markets, equally possible that these new markets may be able to absorb but a small proportion of our products. Conversely, our present investigations may prove of permanent value to these industries.

Possibly the present disorganization of markets may ultimately be to the advantage of producers. It must be remembered that while producers are experiencing difficulty in finding a market, many industries are also finding difficulty in obtaining their usual supplies of raw materials. The latter are therefore more alive than in normal times to the possibility of utilizing new or substitute products to fill their immediate requirements. Advantage must be taken of such opportunities and it may therefore be that ultimately Malaya may find new markets and thus widen her commercial interests.

Original Articles.

COCONUT AND OIL PALM INVESTIGATIONS.

COCONUTS.

The Market in 1939.

The price of copra remained at a very low level throughout 1939. The average Singapore price of the sundried grade was \$3.60, and the mixed grade \$3.30 per picul. Coconut oil showed some improvement, the average price being \$8.94 per picul. Copra cake or "poonac" averaged \$1.77 per picul.

Areas, Production and Exports.

The total area under coconuts is estimated at 614,772 acres, of which 251,469 acres are in the Federated Malay States, 74,409 acres in the Straits Settlements, and 288,894 acres in the Unfederated Malay States.

Owing to the very large local consumption of fresh nuts and oil, the total production in Malaya is unknown. Net exports in 1939 were 34,420 tons of copra, 61,360 tons of oil, 10,707 tons of coconut cake and 6,948 tons of fresh nuts. In terms of copra equivalent the net exports of coconut products amounted to 135,989 tons as compared with 150,944 tons in 1938, and the total value \$11,028,359.

The export of coconut products, on the copra equivalent basis, has declined from the peak of 172,000 tons reached in 1935 to that of the year under review which is the lowest since 1932. These figures, however, do not bear evidence of any decline in the industry. Local demand for coconut oil is considerable and probably has increased during the past few years. It is probable that fluctuations in annual export quantities have been due as much to seasonal variations in crop as to any other cause. The feature of the industry during the past few years has been the steady growth of the local milling industry as is shown by the fact that net exports of oil have steadily increased from about 9,000 tons in 1929 to over 61,000 tons in 1939.

Field Experiments.

At the Coconut Experiment Station, Port Swettenham, a comparison of the results obtained in the picking *versus* natural nut fall experiment indicated that while the mean yield of nuts per palm was unaffected, a large loss of copra was involved owing to germination in the case of the natural nut fall plots.

An experiment has been laid down to determine the effect of various cover crops on coconuts, using grass as a control. The covers under trial are: *Desmodium ovalifolium*, *Indigofera endecaphylla*, and *Crotalaria usaramoensis*. Covers were established by the latter part of the year, but owing to dry weather made slow progress.

Selection experiments at the Station were continued, 13 palms being selected for further examination. Selection was based on a comparison of yields of nuts and weight of fresh endosperm together with a consideration of environmental factors. These palms are now being submitted to further tests which include habit of palm, thickness of endosperm and quality of copra.

The new copra cabinets equipped with a jack-roof have proved highly efficient. A great saving in fuel is effected and the nut capacity per unit area of grill greatly increased. Three of these cabinets, Nos. 4A, 10A and 50A have been given systematic trials. No. 4A has a productive capacity of 3 piculs* per run and No. 10A of 7 piculs. No. 50A is a four-chamber kiln; each chamber has about the same capacity as that of No. 10A. With any of these new cabinets high-grade copra can be manufactured inside an overall time of 2 days, which is less than that at present necessary to obtain dry copra on existing kilns either on estates or small holdings.

Experiments have shown that the gross weight of wet meat is not the only factor to be taken into account when computing the load of a kiln. The thickness of the meat may also have to be considered.

A careful study of the nuts and resultant copra from test plots in areas of unhealthy palms yielding nuts which give "rubbery" copra has revealed the fact that the quality of the meat cannot be economically improved by manurial treatments. The indications are that the chief cause for unhealthy palms producing such copra is lack of effective soil water movement.

The effect of storing copra of different qualities under various conditions has led to the following conclusions:—

(a) Copra is subject to serious loss and deterioration during storage and transport unless properly prepared and promptly warehoused in bulk.

(b) Such deterioration proceeds rapidly at room temperature. It can be effectively checked by loss of excess moisture due to high temperatures obtained on storing the copra in large stacks.

(c) Loss due to such deterioration, especially in the case of raw half-dried copra, may amount to as much as 15 to 20 per cent. of the value of the copra.

(d) Serious deterioration results in an increased proportion of small pieces which are not favoured by the millers.

Small-scale extraction of coconut oil has been found to be impracticable. It is difficult to express more than 30 per cent. of the contained oil from wet coconut meat.

The question of whether the bad effect of *lalang* grass (*Imperata arundinacea*) on coconuts was due to parasitism of the former on the latter was investigated on areas of both young and mature palms. It was found that *lalang* roots only rarely occur within coconut roots and probably gain entry through wounds or where the

* 1 picul = 133 1/3 lbs.

fine rootlets of a main root die. There was no evidence that the injurious effect was due to parasitism, but it is conceivable that direct injury by *lalang* might be more common in areas where cultivation may have injured the coconut roots and *lalang* is permitted to extend in such areas.

OIL PALMS.

The Market in 1939.

Prices of oil palm products remained low throughout the first months of the year prior to the outbreak of the war in Europe, when controlled prices were enforced in the United Kingdom. Malayan oil, sold on a 5 per cent. free fatty acid basis, was quoted between £13 and £13.10.0 per ton, c.i.f. landed weight Liverpool, until July and August when it fell to £12.5.0. Controlled prices were announced by the Ministry of Food in October, and palm oil in bulk was fixed at £16.5.0 c.i.f. The average price for the year was £13.17.7 as compared with £14.3.10 in 1938. Palm kernels were quoted between £8 and £9 per ton c.i.f. landed weight Liverpool during the first eight months of the year; in October and November a controlled price of £8.17.6 was fixed, and this was raised to £10.10.0 in December. The average price for the year was £8.16.3 as compared with £8.19.3 in 1938.

Areas, Production and Exports.

At the end of 1939 the total area planted with oil palms was 75,090 acres. During the year 2,370 acres were planted. Assuming that palms planted before 1935 are now fruiting the fruiting area now amounts to 83.8 per cent. of the total area under this crop.

The production in 1939 was 57,373 tons of oil and 10,172 tons of kernels, as compared with 51,067 and 8,779 tons respectively in 1938. Net exports were 59,712 tons of oil, valued at \$5,911,648 and 10,774 tons of kernels valued at \$545,309.

Experimental Work.

An account of the results to date of manurial experiments will be found in the June, 1940, number of the *Malayan Agricultural Journal*, while an account of experiments to compare natural covers with clean-weeding on yields of oil palm appears in the April, 1940, number of the Journal. Further germination experiments are also recounted in the Journal of April, 1940. No further mention of this work is therefore necessary in this place.

Investigations were continued on the selection and "selfing" of selected palms, but some time must elapse before the value of this work becomes evident.

An investigation was made of the excessive increase in acidity frequently alleged to develop in palm oil during voyages overseas in ships' tanks. A large number of samples of oil were returned from destination ports, and it was thus possible to compare them under identical conditions with samples taken at time of loading in Singapore. These tests revealed undoubtedly that palm oil when shipped abroad is subject to a slightly greater increase in acidity than occurs when the oil remains in Malaya.

A site at the Central Experiment Station, Serdang, hitherto uncultivated, was chosen for the eventual planting of seedlings of West African varieties selected on the basis of depth of colour of oil, combined with yield, the object being to produce a type of oil more potent than the normal oil for medicinal purposes. The local consumption of palm oil, though still small, is continually extending for medicinal use and addition to livestock rations for it serves as a substitute for cod-liver oil as a source of Vitamin A. There are indications of a demand arising in India where Vitamin A deficiency is prevalent and the Department has taken steps to introduce medicinal palm oil into India. Some Malayan estates are now regularly separating the liquid fraction of palm oil and selling it for medicinal purposes.

The palm oil industry has been confronted with a standard of quality previously unrecognized, that of bleachability. The extent of the customers' demand is still vague, but the facts are clear that whereas palm oil for many of its uses requires to be bleached, the degree of bleachability is very variable, and the natural corollary is that oil of good bleaching quality may come to command a higher price. Bleachability may be assessed by measurement of the colour remaining after the oil has been bleached under fixed conditions but the standards so far are tentative. Much laboratory work has been devoted to acquiring information which will be required if and when bleachability becomes a burning question.

In this connexion the main features of knowledge gained are that low free fatty acid content is related, though not causally, to bleachability. Conditions in field and factory which lead to low acidity of the manufactured oil also conduce to good bleachability. Rapid processing of the oil after harvesting the fruit is beneficial, for the oil is unfavourably influenced by other constituents of the fruit, especially the sludge after expression, and it probably suffers from metallic contamination which is facilitated by high acidity. The initial colour of the oil is no criterion of bleachability, within the limits met on Malayan estates, although this does not apply to exceptionally dark oil from West African varieties, nor to oil which is exceptionally pale because produced from immature fruit.

Laboratory determinations of the oil content of immature fruit from a limited number of bunches indicated that the percentage of oil, calculated on the basis of dry pericarp, reached a maximum a few days before the bunch ripened. It became clear, however, that the variability of bunches is so great that determinations on a great number of bunches would be required to give conclusive results.

The variability of bunches was further exemplified in a selection experiment being conducted in co-operation with an estate. At the same time, this latter experiment, in its initial stages at least, gave the impression that the percentage of oil to bunches in respect of high-yielding palms is much below the average.

The self-heating of heaps of freshly separated moist oil palm nuts, which is utilized in small factories to dry them in readiness for cracking, has been traced to thermophilic bacteria, which require a plentiful supply of air. The highest temperature recorded was 63°C. Moulds also flourish, doubtless at lower ranges of temperature, and penetrate the shells and sometimes the kernels. In cases where the air supply is restricted, with resulting check to heat development and delay in drying, these moulds cause very serious deterioration of the kernels.

Replanting problems and stem diseases have received attention, and the results of investigations to date will be found in the *Malayan Agricultural Journal*, September, 1940, page 400. The question of economic replanting of old areas is becoming increasingly important in view of the fact that some of the palms on older areas under this crop are very tall, thus materially increasing cost of harvesting, and that yields on some old areas are now falling below the economic level. Various experiments are in progress at Serdang regarding replanting which are expected to give valuable results.

THE DEVELOPMENT OF RICE CULTIVATION IN MALAYA.*

The dependence of the peoples of equatorial Asia on rice is far greater than is that of inhabitants of temperate climes on wheat, for the latter enjoy a more varied diet in which wheat, although important, does not take a predominant place, whereas, with the rice-eating people, rice forms the bulk of the food eaten. Malaya is no exception to this rule, for rice is the staple food of 99 per cent. of the population of this country. The peasantry and labourers subsist almost entirely on rice, flavoured with a few spices and with a little meat or fish added. Upward in the social scale other foodstuffs are added, but even amongst the majority of the well-to-do Asiatics rice still forms the bulk of the food eaten.

The amount of food eaten should be sufficient to meet the total energy requirements of the individual and also his requirements of the various food factors, such as proteins, vitamins, and minerals. Although cereals alone are insufficient to supply a perfect diet they stand in a prominent position as regards energy value, and moreover, of all cereals a great deal more energy-producing food can be obtained from an acre of land under rice than from a similar area of any other cereal.

The foregoing remarks emphasize the importance of rice in the economy of Malaya and explain why, when we think of food production in this country, it is in terms of rice.

Practically nothing is known of the early history of rice cultivation in Malaya. Rice has, however, been cultivated in parts of India and China since about 3000 B.C., and there is little doubt that its cultivation in Malaya dates from the earliest migrations to this country.

According to Malay tradition, however, rice cultivation was first introduced into Kedah and the neighbouring Malay States in the north of the Peninsula by the Siamese probably in the 15th century. The southern States apparently did not commence its cultivation until about the close of the 16th century. So customary has its cultivation become amongst the Malays in parts of the country that in many instances they have continued to grow the crop, year after year, in situations where lack of irrigation facilities coupled with the use of inferior seed resulted in such small crops as to make the labour unprofitable.

While the method of cultivating rice varies in different parts of the country, to accord with local conditions and customs, there are, in the main, two distinct methods—the dry and the wet. The latter method, used on 92 per cent. of the total area under the crop, produces the heavier yield.

The areas on which wet rice is cultivated are confined to alluvial tracts on the coast and along the banks of rivers. The crop is planted in puddled fields, and grows in water at least for the first part of its development. Dry rice is

* An article prepared by the Department of Agriculture, S.S. & F.M.S., as the basis for the broadcast talk delivered from the Singapore Station on 22nd November, 1940, under the title of "Rice in Malaya."

habitually grown on about 50,000 acres in Kelantan and Trengganu but elsewhere is found on newly-opened jungle land, or in situations where, because of the difficulty of irrigation, the wet method is impracticable. The Sakai tribes, which wander the jungle and settle in one place for but two or three years, often plant dry rice. Because of the relative unimportance of dry rice and the poorness of the crop obtained by this method, no further reference will be made to it in this place.

Before the Malayan Government instituted schemes for the control of the water supply to rice areas, the Malay cultivators were dependent entirely on seasonal rainfall and the operation of such small schemes as they were able to devise and execute by their own inefficient co-operative effort. In this way they have developed some aptitude for water control, and many ingenious schemes to provide dams, irrigation canals and water wheels, devised and constructed entirely by the local community, were, and in places still are, a feature of the rice-growing districts which lie between the hills on the west of the Peninsula. While these schemes were in ordinary circumstances effective, they usually involved an immense amount of labour annually. They were subject to sudden and wholesale destruction in heavy floods, and they not infrequently caused irreparable damage to the banks of the rivers. It must be realized too that they aimed at directing the flow of water over the fields, but did not conserve the water supply for use when rainfall was deficient. The cultivation of the crop under such conditions was therefore difficult, and the cultivators were subject to many disappointments, and sometimes to actual privation through the failure of their crop, either by excessive rainfall or through drought.

For the production of good yields of rice efficient control of water is necessary to ensure a sufficiency in the early stages of growth and the gradual draining off for the final ripening and harvest. In addition, efficient systems of irrigation mean security for the grower since they minimize the danger of crop failure through drought.

The need of engineering skill and capital to control the water supply for rice cultivation was recognized by Government nearly 40 years ago, and the first practical step taken to put this realization into practice was the Krian (Perak) Irrigation Scheme, devised and put into operation by the P.W.D. (Hydraulics Branch) in 1906. The system covers an area of about 60,000 acres, of which about 50,000 acres are actually under rice cultivation. The control of water depends on a catchment area from which, by means of canals, with subsidiary waterways and water-gates, the amount of irrigation water can be controlled over the whole area.

Those who have seen the vast areas under rice in Burma, Siam and Indo-China, are apt to belittle the more moderate expanses to be seen in Malaya. It must be remembered, however, that successful rice growing demands irrigable areas of land, the soil of which is suitable for the crop. The topography of Malaya does not lend itself to vast rice areas. Our coastal belt, upon which rice is chiefly grown, is frequently narrow, though it opens out in the north of the Peninsula and permits the very beautiful expanses of Krian, Province Wellesley, Kedah and Kelantan. The less extensive rice areas in the country follow the course of inland riverine areas,

which are usually narrow. In some countries rice is cultivated on terraced hills, but terraced rice fields involve very intensive labour necessitating high capital expenditure and depend for their success on unbroken and regular mountain slopes and an adequate reservoir of water above the fields, conditions which seldom occur in Malaya.

The entire Malayan production of rice is consumed locally, and, in addition, it is necessary to import large quantities to satisfy the needs of this country. In 1939 local production amounted to 340,000 tons of rice, and net imports were 660,000 tons. Total consumption, therefore, was 1,000,000 tons, constituting a record. Seventeen years ago production was 224,000 tons and net imports 362,000 tons, consumption therefore being 586,000 tons. Thus, although our production in 17 years increased by 50 per cent., our total consumption also increased by nearly 50 per cent., so that we are still producing only 34 per cent. of Malaya's requirements. The reason for this steady increase in consumption is to be found in the continued growth of population with the development of our main industries, tin mining and rubber planting, as well as in the growth of the urban trading population.

The total area under rice cultivation in Malaya is approximately 750,000 acres, of which 35 per cent. is in Kedah and 20 per cent. in Kelantan, as compared with a total area of 561,000 acres 17 years ago.

The importance of maintaining, and indeed increasing, rice production in Malaya has been realized by all thinking people for several decades. The fact that the areas under this crop have not only been maintained, but increased, in spite of the greater attraction of other agricultural industries, particularly rubber production, and the arduous nature of the work, places the country under a debt of gratitude to the Malay cultivator who alone has been responsible for the cultivation of this crop. It was essential for the common weal that food production in Malaya should be maintained, and by the goodwill of the cultivators, backed by encouragement, this has been done.

By many people in Malaya the view has for long been held that the domestic rice supply is of vital importance to the country, and that dependence on imported supplies of rice is a source of danger inasmuch as, in the event of an acute fall in the price of export products, or a shortage in the available exports of rice from other countries, a grave crisis might quickly arise. This latter condition actually occurred in 1919 to 1921, when owing to a rice shortage the Malayan Governments sustained a loss of \$42,000,000 in their efforts to ameliorate conditions, while further unascertained losses to employers of labour were very considerable.

In 1930 a Rice Committee was appointed by His Excellency the Governor, Sir Cecil Clementi, for the purpose of considering the best steps to be taken to encourage rice cultivation in Malaya. Amongst the more important recommendations of this Committee were the establishment of an independent Drainage and Irrigation Department, executive in the Federated Malay States and Straits Settlements and advisory in the Unfederated Malay States, and the intensification of

agricultural research. With a view to providing funds for the extension of rice cultivation in the Federated Malay States the Committee recommended an import tax on rice. In the main, the recommendations were accepted and put into effect without delay. The import tax on rice into the Federated Malay States of \$2.52 per ton was imposed towards the end of 1933; owing to its unpopularity it was removed 18 months later. Neither irrigation nor research work has, however, suffered by the repeal, as funds for the continuation of the work were provided from general revenue.

Rice production may be increased in two ways: by an increase in the crop per acre on existing cultivated areas, and by development of new areas. The work of the Department of Agriculture has aimed at the increase of the crop per acre, while the aim of the Drainage and Irrigation Department has been, primarily, to develop new areas for the cultivation of the crop, as well as to increase crop yields by the provision of small permanent irrigation works in existing areas to replace the very unsatisfactory and uncertain brushwood dams, wooden water wheels and so forth upon which the cultivator previously relied. A glance at the last Annual Report of the Drainage and Irrigation Department shows that in addition to the development of new areas, the Department now maintains 95 irrigation areas in the Federated Malay States and Colony. The chief new areas opened for rice cultivation by the Drainage and Irrigation Department are at Sungei Manik in Perak, and Panchang Bedena in Selangor. These two schemes will eventually bring into cultivation an area of about 30,000 acres each or a total of 60,000 acres, of which, so far, 10,000 acres at Sungei Manik and 15,000 at Panchang Bedena are actually completed. In addition, there are a number of other schemes in these and other States.

The Department of Agriculture has continued and intensified the work which has been in operation for about 25 years. There are four main Padi Test Stations, situated in Perak, Malacca, Kedah and Kelantan where the work of isolation of high-yielding strains is continuously in progress. In addition, over 50 smaller Padi Test Stations are distributed throughout the rice-growing districts, the main function of which is to discover the strains of rice best suited to local conditions. The success of the work is undoubted. Lack of space prevents any detailed account of the efforts of the Department of Agriculture to increase production by means of selected high-yielding strains. It may be mentioned, however, that one such strain has proved so suitable for Krian that 69 per cent. of the total padi purchased by the Government mills in Krian in 1939 was of the strain known as Seraup 48 for which not only the Government mills but private mills also paid a premium of 10 cents a picul.

Side by side with this work, investigations have proceeded to reduce damage by insect pests and a systematic organization established in the main areas to minimize the damage occasioned by rats.

The Department of Agriculture has also investigated soil conditions and the problem of manuring. With regard to the latter, except on certain sandy soils the response to manuring has been found to be uneconomic.

In 1918 the Government decided to erect a mill at Bagan Serai in the Krian District of Perak, and in 1921 a large mill was purchased at Kuala Kurau in Krian. The former has been operated continuously by the Government since its erection, but the other mill has not been used since 1927. A further mill at Parit Buntar was purchased in 1935 and run by the Government. The Rice Commission testified that the Government Mill at Bagan Serai has attained the object aimed at and its effects in stabilizing prices had been felt as far north as Perlis. During recent years several smaller mills have been established by various Malayan Governments with similar objects.

One of the difficulties of the cultivator is that of finance. Although the work of cultivation is usually done by himself and his family and therefore without wages, yet frequently he requires cash for rent, implements, water and so on and to tide him over until the crop is harvested. Where cases of hardship occur in the Federated Malay States the Government, through the District Officer, is empowered to advance money, on note of hand only, on favourable terms to the borrower. Of recent years the Co-operative Department has established a number of Seasonal Credit Societies especially designed to help the padi planter, and these show signs of filling the need which exists.

In the foregoing remarks an attempt has been made to show how long-range schemes have been inaugurated and developed having as their object the improvement of the rice-growing industry. There is and can be no finality about such schemes; but the weight of the various forces brought to bear on the problem steadily and surely results in progress.

And now we come to the present situation, caused by the outbreak of war, making it doubly imperative that we should be sure of our food supplies. The new situation thus created has not meant the abandonment of schemes already designed or inaugurated, but rather of supplementing them by special measures to speed up development.

The first consideration has been that of securing our more immediate supplies of rice. With this object padi stores were established in various parts of the country. In order to encourage production and to assist growers to secure a reasonable price for their padi, further Government rice mills have been erected, and some are already operating, in different parts of Malaya, while storage capacity has been increased at other mills.

As a further measure to encourage padi production, the Government of Perak has guaranteed a price of \$2.50 per picul for padi, delivered at the mill, for a period of three years. This guarantee should encourage the settling of new areas and prove of particular value to cultivators working in newly-opened areas, for in the first few years yields are likely to be low and unremunerative at market prices.

Further to encourage more rapid development of the new area at Sungei Manik in Perak, employment has been offered to 4,000 Malays in felling and burning jungle within the irrigated area. Those who carry out this work will have first claim to the normal allotment of 5 to 6 acres of felled land for padi-growing and 1 acre of kampong land for their homestead. The land will at first be held under Temporary Occupation Licence, but a permanent title may be given after three years. A bonus of \$10 per acre will also be given to holders who have cleared and stumped their land within one year of occupation. A similar scheme is to be operated in the Krian District.

The above is but an example of the way in which the State Governments are accelerating the development of new areas. Investigations by the Drainage and Irrigation Department are a necessary preliminary, while the work of developing schemes must take some time. Development, however, is proceeding as rapidly as possible and one may anticipate a material increase in the country's padi areas within the next few years.

His Excellency the Governor announced some time ago that the policy which hitherto had been followed of confining padi cultivation to Malays would be abandoned in favour of allowing Asiatics of other nationalities to cultivate this crop. This does not mean an influx of non-Malays into areas now cultivated by Malays, but the development of new areas by non-Malays. The Department of Agriculture and the Drainage and Irrigation Department are investigating several potential padi areas in Perak, and it is understood that the Chinese Chamber of Commerce is co-operating with the Perak Government in the selection of suitable colonists for such new areas.

Efforts to increase padi production are not confined to Perak; Kedah may develop a considerable new area in the future, Selangor is alive to the importance of the subject and is pushing ahead with the development of areas on lines similar to those described for Perak, while reports from other States indicate that very real progress may be expected in the improvement of present areas and the development of new areas. It must be remembered that the problems of each State are individual—there cannot be one scheme applicable to the country as a whole—and it is therefore the man on the spot who can advise and advance schemes to suit the peculiar needs of each State. But whether it be the improvement of existing areas or the development of new areas, the drive is for the greatest possible increase in rice production in the shortest possible time.

Development must, however, be attained with due regard to the economics of production. Crops must be sufficiently good that they allow a fair return to the cultivator. If the country is to benefit from developments it is imperative that the cultivator shall produce more rice than is sufficient for the needs of himself and his family. Government has therefore set its face against immigration to supply new cultivators. A large proportion of the produce is consumed in process of

cultivation. For instance, a normal holding of 3 acres must support a family equivalent to four adults, who in a year will consume about 240 gantangs of rice. Their holding may produce 400 gantangs of rice per annum, thus leaving only 160 gantangs of rice for sale.

An attempt has been made to describe in outline the work which has been done to increase Malaya's production of rice, and the stimulus to production inaugurated since the outbreak of the present war to accelerate development. Our hopes are centred on encouraging the development of new areas and on increasing the crop per acre. Some of the schemes should result in increased production within a short time, but others may take some years to reach fruition. The problem of rice supplies is not, however, only a war problem. We build our policy of rice production not merely on the necessity of ensuring the food supply during the war, but as an insurance for the future. It is possible that post-war years will be fraught with economic difficulties; it may be that serious dislocation of trade will be experienced. Should such a position arise the welfare of the people of Malaya will depend in a large measure on self-sufficiency in the supply of the staple food of the country--rice.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

3rd Quarter, 1940.

*Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S.,
in collaboration with the Field Branch of the Department.*

Rainfall.

Weather conditions were fairly normal during the quarter. July was hot and dry; August also was dry with some rain, and September was generally a wet month, though in some localities rainfall was below the average.

Prices.

Prices paid during the quarter for small-holding rubber are summarized in Tables I and II.

In Kedah there was a big fall in coupon values in August from \$33 to \$23 per picul equivalent. In Penang and Province Wellesley coupon values were \$20 to \$25 at the commencement of the quarter, but later fell to \$18. In Perak values of coupons ranged from \$23 to \$28. In Kelantan coupon values in July were \$19 to \$26.50, but in September were \$24 to \$25.20. In Johore North coupons were valued at \$18 to \$24 in Muar, but in Segamat were as high as \$26.

Uncoupons rubber was sold in a Perak district at \$19.30 per picul, but in Johore North it rose from a range of \$16 - \$23.20 to \$18 - \$24.50.

Production and Tapping.

Statistics of rubber production on small holdings during the quarter are given in Table III. Production was again high, though slightly less than in the previous quarter.

The results of the quarterly survey of small holdings are summarized in Tables IV and V and show a further increase in tapping, probably partly due to the enhanced price of uncoupons rubber.

In some parts of Perak dry weather prevented early work in the padi fields, thus permitting more tapping. Instances of over tapping and tapping during wet weather were reported in Perak, also slaughter-tapping before felling for replanting.

Quality of Rubber and General Conditions on Holdings.

The Pahang report states that Singapore dealers are now making more decided cuts for low-grade rubber, \$2 to \$4 per picul as compared with 60 cents to \$1 previously, and these cuts are being passed on to the small-holders with the result that they are being compelled to prepare sheet more carefully. Kuantan sheet continues to be smoked and of fair quality, but elsewhere in Pahang the quality has declined as compared with the same period last year, nor is smoking by small-holders very general. Lack of good water has been a serious disability in many areas.

Table I.
Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.
(In Malayan dollars per picul of 133 1/3 lbs.)

3rd Quarter, 1940.

Quality	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				JULY					
Smoked sheet	44.00-46.00	40.00-45.50	40.50-45.00	41.00-45.00	40.00-52.50	44.50-45.80	41.00-44.80	39.00-45.50	36.50-40.80
Unsmoked sheet	41.00-45.00	38.00-44.50	40.00-42.60	40.00-43.00	38.00-42.50	42.50-44.80	39.30-43.80	35.00-43.00	32.20-39.00
Scrap	25.00-28.00	27.00-30.00	26.00-29.50	—	—	28.00-34.00	27.00-32.50	18.25-34.50	22.00-26.50
				AUGUST					
Smoked sheet	45.00-47.00	37.00-45.50	41.50-46.00	42.00-47.00	40.00-48.00	44.50-46.60	40.70-44.90	40.00-45.50	37.00-41.50
Unsmoked sheet	41.00-46.00	33.00-43.80	41.00-43.00	40.00-44.00	37.00-43.00	42.50-45.25	39.50-43.60	35.00-43.00	35.00-39.50
Scrap	25.00-28.00	30.00-32.00	30.00-32.00	—	—	28.50-32.00	27.20-38.00	19.80-34.30	23.00-27.50
				SEPTEMBER					
Smoked sheet	44.00-46.50	42.00-45.33	40.50-45.00	41.40-47.00	41.00-44.80	45.50-46.70	40.00-45.50	40.00-46.00	39.50-44.30
Unsmoked sheet	42.00-45.00	39.00-43.50	40.00-44.00	40.00-45.00	38.00-42.90	43.00-44.50	39.10-44.10	38.00-44.00	36.00-42.80
Scrap	24.50-31.00	29.00-30.00	30.00-32.00	—	—	29.50-33.00	23.00-30.00	17.00-34.50	25.00-28.50

Table II.
Mean of Lowest and Highest Rubber Prices Paid by Local Dealers
at a number of Centres in each State.
(In Malayan dollars per picul of 133 1/3 lbs.)

3rd Quarter, 1940.

Quality	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				JULY					
Smoked sheet	44.50-46.00	42.05-43.51	41.97-44.13	41.75-44.15	41.68-44.58	45.07-45.60	42.09-44.65	41.46-44.08	37.75-39.90
Unsmoked sheet	42.62-44.12	39.96-41.99	40.50-42.55	40.75-42.70	39.74-41.25	43.33-44.10	40.18-43.00	39.12-41.58	34.60-36.60
Scrap	25.00-27.00	27.00-30.00	26.00-29.50	—	—	29.83-31.00	27.10-30.58	26.14-30.31	23.75-26.25
				AUGUST					
Smoked sheet	45.25-46.75	42.38-44.15	42.57-44.75	43.15-45.60	41.49-44.72	45.37-46.12	41.77-44.72	41.94-44.18	38.65-41.25
Unsmoked sheet	43.00-44.50	39.93-42.64	41.00-43.00	40.50-43.75	39.48-41.37	43.67-44.50	40.60-42.48	39.75-42.08	36.65-39.00
Scrap	26.00-27.00	30.00-32.00	30.00-32.00	—	—	29.50-30.83	30.40-32.38	26.34-29.33	24.50-27.25
				SEPTEMBER					
Smoked sheet	44.75-46.25	43.38-44.30	42.23-43.98	43.18-45.88	42.04-44.09	45.57-46.40	42.62-45.37	42.35-44.04	41.50-43.90
Unsmoked sheet	43.50-44.50	41.07-42.25	40.00-43.00	40.95-44.00	39.81-41.69	43.50-44.33	40.78-43.28	40.53-42.35	39.00-41.40
Scrap	25.75-28.17	29.00-30.00	30.00-32.00	—	—	31.17-32.17	25.67-29.50	26.36-27.68	25.75-27.00

Table III.
Production of Rubber on Small Holdings.
 (in tons)

		Total Jan. to Sept. 1939	1st Quarter 1940	2nd Quarter 1940	3rd Quarter 1940	Total Jan. to Sept. 1940
Federated Malay States	...	39,205	22,637	28,553	28,062	79,252
Straits Settlements		7,065	3,781	3,931	3,867	11,579
Unfederated Malay States	...	39,359	21,973	26,881	24,254	73,108
TOTAL MALAYA	...	85,629	48,391	59,365	56,183	163,939

A Perak report points out that as almost all the coagulants used now contain sulphuric acid the quality of the sheet has fallen somewhat. Interest in smoked sheet has abated in Krian, but in Selama smoked sheet is still the marketable form.

In Kelantan smoke-houses completed now total 106, while 24 are under construction, and 41 are projected. The majority of smoke-houses are operated on a co-operative basis. A survey covering 2,294 rubber holdings in various parts of the State showed that 45.5 per cent were still using alum as a coagulant; 23 per cent. were using sulphuric acid, and only 30 per cent. acetic acid. While this result may not be fully representative of the whole State it indicates that there is still a great deal of work to be done in connexion with rubber manufacture. The prices paid for Kelantan rubber are low in comparison with other States.

In Malacca all sheet is unsmoked of good average quality, small-holders finding the small premium paid for smoked sheet not worth the additional labour of smoking. Smoke cabinets erected on the advice of Asiatic Rubber Instructors are no longer used.

In North Kedah several coagulating sheds were repaired and improved, and one smoke-house was brought into commission again.

In Pahang attention continues to be directed to the establishment of approved covers, and seed is obtained through the Asiatic Rubber Instructors. Natural covers, usually well maintained, are general, but there is still scope for persuading small-holders, chiefly Chinese, to forego clean-weeding. Soil erosion propaganda is having effect, particularly the demonstrations at the Lebu plot in Bentong which were well attended. Another plot is to be opened in the Sabai and Pelangai mukims of Bentong.

Table IV.
Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of September, 1940.

PERAK					SELANGOR					NEGRI SEMBILAN					PAHANG				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage	
Batang Padang	36,187	5,100	14		Klang	16,143	4,500	28		Seremban	23,639	15,600	66		Raub	10,534	6,000	57	
Kinta	38,874	4,300	11		Kuala Langat	23,881	4,300	18		Tampin	21,896	8,100	37		Kuala Lipis	15,457	2,000	13	
Kuala Kangsar	92,166	11,100	12		Ulu Langat	45,012	7,200	16		Kuala Pilah	31,832	12,700	40		Bentong	12,224	1,300	11	
Upper Perak	15,590	3,700	24		Ulu Selangor	31,463	7,200	23		Jekebu	9,097	1,300	14		Other Districts†	40,373	11,100	24	
Larut & Selama	43,132	6,900	16		Kuala Lumpur	20,277	6,100	30		Port Dickson	11,133	6,800	61						
Krian	9,408	4,700	50		Kuala Selangor†	8,417	1,800	21											
Lower Perak†	26,735	4,300	16																
Dindings	9,873	2,900	29																
	271,965	43,000	16			145,193	31,100	21			97,597	44,500	46			84,588	20,400	24	
MALACCA					PENANG & P. WELLESLEY					SINGAPORE					JOHORE KEDAH KELANTAN				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage						
Central	14,003	3,800	27		North	3,549	400	11		Singapore	20,115	400	2			350,007	24,500	7	
Alor Gajah	30,838	10,800	35		Central	10,785	4,000	37								102,126	11,200	11	
Jasin	25,286	5,800	23		South	8,936	500	6								49,133	5,800	20	
					Penang	15,822	9,700	61								2,916	5,900	18	
	70,217	20,400	29			39,092	14,600	37			20,115	400	2			29,836			

The percentage of areas out of tapping in June, 1940, was as follows:—Perak 19, Selangor 30, Negri Sembilan 48, Pahang 25, Malacca 20, Penang and Province Wellesley 18, Singapore 2, Johore 11, Kedah 11, Kelantan 23.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

Table V.
Comparisons of Areas of Rubber Small Holdings Out of Tapping

	September, 1939		June, 1940		September, 1940	
	Acres	Per-centage	Acres	Per-centage	Acres	Per-centage
F.M.S. ...	210,000	35.0	165,700	27.6	139,000	23.00
S.S. ...	32,400	25.0	21,500	16.6	35,400	27.4
U.M.S. ...	122,600	21.0	67,600	12.7	47,400	8.8
Malaya ...	355,000	28.0	254,800	20.2	221,800	17.6

In Selama, Perak, the condition of most small holdings is reported to be good. In Krian, owing to the increase in tapping, many holdings which were previously under secondary jungle have been slashed.

Another Perak report states that while on many old holdings nothing is being done to check soil erosion some owners are opening up old silt pits, and on many Chinese holdings selective weeding is being carried out. On replanted and newly planted areas many owners are planting cover crops, and fair quantities of seed continue to be bought through the Department. There are, however, many large areas where no effort is being made to conserve the soil on land planted or about to be planted with rubber.

Planting.

Very little interest is being displayed in replanting in Kelantan, and as far as is known at present less than 5 acres of small holdings are to be replanted. In Kedah also it is reported that there is not much interest in replanting.

Elsewhere there has been considerable replanting and there has been a large demand for budwood for both newly planted and replanted areas. In some localities estates have helped in supplying budwood to small-holders.

The Pahang report mentions that many Chinese and a few Malays have put down multiplication nurseries of several approved clones. Catch cropping is common on newly planted areas, especially with Chinese small-holders. The same report states that the use of high-quality planting material has engaged most of the time of the Asiatic Rubber Instructors, and the routine demonstration work on sheet making and disease control has been left to Asiatic Rubber Demonstrators; similar remarks are contained in other reports.

A Perak report says that the growth of young rubber in up-river mukims has been very disappointing. The small-holder will not work the land himself, nor will he supervise his paid labour. Thus the land becomes choked with *lalang* grass, secondary jungle growth or catch crops of tapioca, and the resulting stand becomes very uneven and not worth budding. The soils are fertile, however, in these up-river mukims but most small holdings badly require replanting, and there is considerable scope for an Asiatic Rubber Instructor in this locality.

Some of the Malay youths in Temerloh, Pahang, who were trained to bud are charging small-holders 30 cents per successful bud which is considered excessive. Small-holders can themselves learn budding technique from the Asiatic Instructors and obtain the latters' assistance. In Selangor a small-holder insisted on carrying out his own budding in spite of lack of experience and advice to the contrary. He obtained 3 per cent. successes only and has now decided to have the buddings done again by an experienced budder.

Pests and Diseases.

Mouldy Rot was reported in most districts, particularly when the wet weather commenced but control was effected by usual methods. Some small-holders complained that painting the trees with fungicides renders the bark attractive to pigs, and so reverted to the use of tar.

Mites were reported on nurseries in Kuantan, Pahang, but were destroyed by applications of sulphur dust.

Some cases of pink disease were reported and root disease remained prevalent in some localities.

General.

The Rural Lecture Caravan toured West Pahang during the quarter, and appropriate lectures on rubber topics were given.

Sulphuric acid has been sold in most districts for use as a coagulant but control measures are now commencing to take effect. In Jitra, Kedah, a change to acetic acid has been effected as a result of intensive propaganda.

Two Johore reports state that the sale of latex has now virtually ceased, but it continues in Johore North. In the Segamat District it was estimated that approximately 40 per cent. of small-holding rubber was sold in this form.

Abstract.

THE FOOD VALUE OF BANANAS.

Under the title "The Banana in Relation to Human Nutrition," included in the August 1940 issue of *Tropical Agriculture*, Mr. H. R. Barnell, of the Low Temperature Research Station, Trinidad, summarizes the world trade in bananas, the storage of the fruit, and then proceeds to an account of the composition and quality of bananas, of which the following is a summary.

Composition and Quality.

The composition of the "eating-ripe" banana is by no means constant and the quality of the fruit available to the consumer varies considerably. Eating-quality is indefinable but is judged by the flavour, aroma and texture of the fruit pulp. Flavour depends on the chemical composition of the pulp; texture depends on the physical state of the various constituents. The flavour is a complex of sweetness from the sugars, bitterness and astringency from the glucosides and tannins, sourness from acids, together with various subtle contributions to the total taste and bouquet from esters, aldehydes and organic acids. The texture depends upon the state of turgor of the pulp cells and upon the amounts of cellulose, hemicelluloses, starch, pectin, and other semi-solid or colloidal materials present.

The final eating-quality of a banana depends on the initial condition of the fruit on cutting and on its subsequent treatment during storage and marketing. The grade or level of maturity at which it is harvested determines to a considerable extent the length of storage which is possible; thus heavy-grade fruit given cold storage for a period suited to a lighter grade, when ripened are of inferior quality described as "chilled".

Table I gives data representative of preliminary results obtained in the analysis of eating-quality in the banana. In this table the percentage amounts of various constituents of the pulp of good quality and of poor quality "chilled" fruit are compared at, as nearly as can be judged, similar stages of eating ripeness. It will be observed that the slower ripening of the pulp of the "chilled" fruit will generally result in its being eaten while the starch content is relatively high and the sugar content relatively low compared with normally stored and ripened fruit. Sucrose tends to be low, glucosides and acid high compared with "normal" fruit.

Nutritional Value.

The banana in the past has suffered from an unjustifiable belief held by many that it is an indigestible starchy fruit. In truth the well-ripened banana contains a small proportion of easily digested starch, much sugar, some protein and a certain amount of hemicelluloses; the residual substance, mainly cellulose, is small.

Table I.

Composition of "Normal" and "Chilled" Bananas when "Eating Ripe".

Grade and Treatment	Eating Quality		Percentage Fresh Weight				Acid ml. N/10 NaOH per 100 gm. Tissue
			Starch	Total Sugars	Sucrose	Glucosides	
Heavy $\frac{1}{2}$ -full. 8 days at 53°F. Ripened at 68°F. for 8 days	Excellent	...	3.74	11.52	3.39	0.35	58.2
As above. Ripened at 68°F. for 10 days	Excellent	...	1.71	12.63	3.82	0.23	59.4
Heavy $\frac{1}{2}$ -full. 14 days at 53°F. 5 days at 68°F.	"Chilled"	...	7.52	6.59	1.89	0.24	66.0
As above. 7 days at 68°F.	"Chilled"	...	3.67	10.21	2.42	0.63	64.6
As above. 10 days at 68°F.	"Chilled"	...	1.62	11.25	2.36	0.66	61.0

Calorific Value.

The banana is a rich source of energy, ranking higher than the potato: banana 108 Cal. per 100 gm., potato (old) 82, (new) 90. Excluding dry cereals it is amongst the cheapest energy-providing foods available to the English market. The banana is a valuable crop for local consumption because of its high yield per acre of food and energy; it has been stated that this yield during a year can exceed that of any other crop.

Approximately 24 bananas will satisfy the energy requirement of an adult performing no manual labour (about 2,400 Calories). The relatively low amounts of protein and fat in the banana, however, render it unsuitable as a sole source of food. The addition of milk in suitable proportion to the banana provides a balanced ration adequate for all energy and tissue-building needs of the body.

Vitamins.

In industrial and other areas where fresh fruit and vegetables are not always easily obtainable the banana may provide a cheap and convenient source of the accessory food factors necessary to maintain full health. While the banana cannot be considered rich in any particular vitamin it contains A, B1, B2 (or G) and C in reasonable quantities; the antirachitic Vitamin D is present in small amount only (De Caro and Locatelli, 1937); there is little information available concerning Vitamin E in the banana, though it has been reported present in small quantity (Evans and Burr, 1927, quoted in Hawk and Bergeim, 1938).

Vitamin A, the anti-xerophthalmic vitamin, supplies of which are necessary for efficient use of foodstuffs in growth and to maintain resistance to disease, is present in greater amount than in the apple. The Gros Michel banana amongst fruit, may be considered a good source of this vitamin (0.8 I.U./gm., Coward, 1938); (2.50 to 3.36 I.U./gm., Harris and Poland, 1937); (1.30 I.U./gm., Leong, 1939). There is a wide range of values for Vitamin A content amongst different banana varieties; some varieties, grown in Malaya, have much higher amounts present than the Gros Michel (Leong, 1939).

B1, the anti-neuritic vitamin, is found in the banana in amounts considerably in excess of those in other fruits and in greater amount than in white bread. As a source of this vitamin the banana is equal to many brown and whole-meal breads (amount of B1 in the banana: (a) 0.5 I.U./gm., Baker and Wright, 1938; (b) .14 to .18 I.U./gm., Harris and Poland, 1937).

The Vitamin B2 complex includes the anti-pellagra vitamin. One determination of this vitamin for the banana is available and, in terms of Riboflavin (a constituent of the complex), is 0.0075 mgm. per 100 gm. (Kuhn, Wagner-Jauregg and Kaltschmidt, 1934, quoted by Fixen and Roscoe, 1938) and is higher than the amounts found in most fruits (see tables, Fixen and Roscoe, 1938).

There have been numerous estimations made of the Vitamin C content of the banana and a wide range of values has been obtained. While the banana cannot be classed with the citrus fruits in its anti-scorbutic properties it has a useful amount of Vitamin C and if eaten in quantity would give a measure of protection against scurvy. The values for ascorbic acid (Vitamin C) in the banana given in Fixen and Roscoe's (1938) tables range from 0.01 to 0.15 mgm./gm., the higher values probably being most accurate according to recent investigations into the technique of Vitamin C determination (Thornton, 1938). It is interesting to note that unripe bananas have a higher Vitamin C content than ripe. The plantain (in many respects similar to an unripe banana) may have a Vitamin C content ten times as great as a ripe banana (Rudra, 1936).

Mineral Salts.

The banana in common with other fruits, yields an alkaline ash (0.6 to 0.8 per cent. of the fresh weight of the pulp) containing over 50 per cent. potash; the remainder includes such important nutritional elements as phosphorus, calcium and iron. These elements are, in general, present in greater amount in bananas than in either apples or oranges. The importance of calcium and phosphorus in bone and tooth formation and general nutrition is well known. It has been stated that all the iron in the banana is in a completely available form and can be utilized in the formation of haemoglobin (Smith and Otis, 1936).

The virtues of the apple in the diet have long been appreciated and much research work has been done to ensure a constant and ample supply of this fruit for the consumer. The banana is, on every count, a more valuable fruit. It is an unusually hygienic food due to its relatively thick and resistant skin; it has a higher calorific value, weight for weight, than the apple. Its protective food (vitamin) content is more diverse than that of the apple and is greater for those vitamins common to both fruits.

Reviews.

Growing Plants without Soil.

By D. R. Matlin, M.A., Professor of Plant Chemiculture, Belmont Evening High School, Los Angeles, California. 2nd Edition. Published by Chemical Publishing Co. Inc., New York, 1940. Obtainable from E. & F.N. Spon, Ltd., 57, Haymarket, London, S.W.1. Price \$2 U.S. currency.

During recent years the horticultural as well as the general public in Europe and America has been taking considerable interest in "hydroponics," "plant chemiculture," "tank farming," or "soil-less agriculture," which are some of the terms applied to the practice of raising plants, either as a hobby or as a commercial venture, by growing them in nutrient solutions or in sand to which nutrient solutions are added.

It is interesting to note that methods of "chemiculture" date back to about the year 1840, and that some of the formulae for nutrient solutions described in 1860 (Sacks) and 1865 (Knopp) are still in use, and, amongst others, have been employed by plant physiologists for many years mainly in studying the growth requirements of plants.

In 1929 Dr. Wm. Gericke, a plant physiologist of California, showed how nutrient solutions could be employed to raise crops of vegetables and other food-stuffs, since when the commercial aspect of the subject has received considerable study.

This book is the latest addition to the literature on "hydroponics" and has been written with the object of giving practical and up to-date information to students and horticulturists or those who take up the subject as a hobby. Short chapters have also been added on growth-promoting substances, greenhouses, deficiency diseases, vitamins and methods of chemical analysis.

The book deals briefly but adequately with the preparation of nutrient solutions and their use in tanks, and includes Prof. Matlin's own revised formulae for use with "hard" or "soft" water. Photographs, rather poorly reproduced, and line drawings show some of the types of apparatus commonly used.

Daily papers and magazines from time to time publish popular articles on this subject and the layman is perhaps impressed with the apparent ease by which crops can be grown without laborious effort. It should be mentioned, however, that the solutions need careful preparation and constant attention all the time, and there is perhaps more effort expended in obtaining a crop than is realized.

On account of the necessity for providing shelter from wind and rain for plants grown in liquid on a commercial scale, glasshouses are generally required in Europe and America. In view of the heavy rainstorms which occur in Malaya, it would certainly be necessary to devise a suitable method for protecting the plants and the solutions before adopting soil-less culture methods as a commercial venture. Other matters which would appear to require attention locally include providing shade

for the tanks or containers so as to prevent overheating of the solution by the sun, rapid evaporation leading to concentration of the nutrient solution, and control of mosquitoes which, it has been found, can breed in the containers.

While soil-less culture has already proved of value elsewhere, (*e.g.* in supplying fresh vegetables to Trans-Pacific Airliners at Wake Island and to householders in large towns distant from supply areas) there does not appear to be much object in attempting to apply it, on any extensive scale, to vegetable growing in this country where land is easily obtainable and where the producers of the main supplies are not accustomed to the use of chemical fertilizers. As an interesting, instructive and possibly a profitable hobby, however, "hydroponics" offers a field of experiment to local, keen horticulturists particularly in the growing of tomatoes—a crop which frequently fails in Malaya owing to soil-borne disease and for the produce of which there is a ready market.

Note:—Another useful book on the subject is "Soil-less Growth of Plants" by C. Ellis and M. W. Swaney. 1938. (Reinhold Publishing Corporation, New York, price 13s.6d.). There is also an informative article entitled "Growing Plants Without Soil by Nutrient Solution Methods" by Templeman and Watson in the *Journal of the Ministry of Agriculture* Vol. XLV, No. 8, November, 1938, obtainable from His Majesty's Stationery Office, London, price 6d.

A. T.

An Agricultural Testament.

By Sir Albert Howard, Oxford University Press. 224 pp, 3 appendices, 13 plates, 11 figs. Price 15 shillings.

There will be many who will disagree violently with much of what is written in this work but there should be no one who will deny that the author has made a valuable contribution to agricultural literature in this statement of his experiences and conclusions as an apostle of the humus idea. Sir Albert has declared himself in this present work as a stern critic of present methods of agricultural research and though it is difficult to avoid the feeling that he has overstated his case he nevertheless presents a host of stimulating ideas and a number of convincing arguments in its support.

The theory that humus is the life of the soil is one of the oldest in agriculture. The work of Liebig and many workers after him tended to the abandonment of the humus theory in favour of a more chemical attitude to the soil, to the adoption of what Sir Albert scornfully refers to as the NPK mentality. Nowadays humus is coming back into its own and perhaps Sir Albert will agree that its position will be none the less secure for its passing loss of caste. In the meantime much damage has been done to the soil all over the world but it is to be hoped that we have learnt the lesson in time to save what remains for posterity. There is nevertheless no room for complacency and works like this *Agricultural Testament* are essential to remind us of this and of the fact that humanity holds its precarious position on this planet because of Nature and not in spite of her.

G. G.

A Survey of Insecticide Materials of Vegetable Origin.

Edited by H. J. Holman. The Imperial Institute, London, S.W.7. 155 pp. 1940.

Price 3s. 6d. net.

The production of insecticide materials derived from plants is of increasing importance, but although in recent years a great deal of work has been carried out on the chemical and insecticidal aspects of this group of plant products there has been, until the appearance of this volume, no general survey of this work which would serve to draw the attention of buyers and users to these insecticides, and contain a summary of the investigations in producing countries.

This book has been issued under the auspices of the Consultative Committee on Insecticide Materials of Vegetable Origin, a body which appointed a Sub-Committee of experts to consider the form which the publication should take and to assist in compiling the preliminary draft. The result of the labours of the members of the Sub-Committee is this comprehensive volume.

The Survey is divided into five parts dealing respectively with alkaloid-containing materials, plants containing rotenone and allied compounds, pyrethrum, quassia and plant oils.

Malayan interests are centred in derris, and the section dealing with rotenone and allied compounds will therefore command special attention in this country. Much of the information given on derris is based on work carried out in Malaya and published in the *Malayan Agricultural Journal*. A comparison of derris as an insecticide with other plants used for insecticidal purposes will, however, be found fruitful. The section on the rotenone-containing plants is the most lengthy in the book; it deals not only with derris but with lonchocarpus, tephrosia and mundulea. A comparison of these plants is inevitable and it is therefore convenient that the facts concerning each should be so placed as to render a comparison possible.

Producers of vegetable insecticides, as well as buyers and users, should find this Survey a most useful summary of the somewhat voluminous and scattered information on the subject.

D. H. G.

Notes and Comments.

DR. H. A. TEMPANY, C.B.E.

The Department of Agriculture, S.S. and F.M.S., has learnt with considerable satisfaction of the recent appointment of Dr. H. A. Tempany to the post of Adviser on Agriculture to the Secretary of State for the Colonies.

Dr. Tempany was Director of Agriculture, S.S. and Adviser on Agriculture, Malay States, from 1929 to 1936 when he retired and became Assistant Adviser on Agriculture to the Secretary of State for the Colonies.

Sir Frank Stockdale, who held the post to which Dr. Tempany has now been appointed, has been appointed Comptroller for Development and Welfare in the West Indies. Sir Frank Stockdale paid an official visit to Malaya in 1937 to discuss Malayan agriculture and agricultural policy in this country with the Adviser on Agriculture.

POULTRY AT THE SCHOOL OF AGRICULTURE.

There were nearly 450 head of poultry at the School of Agriculture at the end of 1939, of which rather more than half were layers. The population include native and upgraded fowls as well as pure-bred Rhode Island Reds and Buff Leghorns. Of the last-named there were but two, the only survivors of 19 chicks hatched in May from 50 eggs imported by air-mail from England, the remainder having succumbed one by one to pneumonia. Fortunately, the survivors comprise one of each sex and they will be mated in 1940 in order to ascertain whether they can transmit to their offspring the ability to live under Serdang conditions.

Apart from losses from pneumonia, health was good on the whole, but many of the pure and 7/8ths bred Rhode Island hens which lost condition during the 1938 monsoons remained unthrifty throughout 1939, and considerable difficulty was experienced in establishing satisfactory breeding pens. The precise cause of this seasonal loss of condition is still unknown. Following the breaking of the monsoon, egg production falls off, appetite declines, a moult usually sets in, the birds become dull and anaemic, and there is usually a serious increase in the mortality rate. Post mortem examinations have so far revealed nothing.

Feeding trials at the School during the year showed the marked superiority of imported white fish meal over whale meat meal in securing rapid growth in young chicks, although there would appear to be little or nothing between them in rations for growers and layers. Unfortunately, the war has for a time being put an end to imports of both these protein concentrates. Analyses of local "cannery waste" (a by-product of the Lumut fishing industry) indicated that this material, although somewhat inferior to imported white fish meal, would provide an effective substitute if the present difficulties of marketing could be overcome. The value of household scraps for feeding poultry has been investigated and rations on this basis drawn up. Poultry Leaflet No. 4 "The Feeding of Poultry on Household Scraps" con-

tains valuable advice on this subject. Copies may be obtained, free of cost in Malaya, on application to the Department of Agriculture. This publication is not available for distribution outside Malaya.

Sales from the poultry section at the School of Agriculture during 1939 were as follows:—mature fowls for laying or breeding 59, fowls for consumption 196, eggs for hatching 1,037, eggs for consumption 28,639. Income from this source amounted to \$1,462. In addition, 10 R.I.R. cockerels, 311 R.I.R. and 1,075 half-bred eggs for hatching and 37 half-bred chicks were distributed free to Agricultural Officers for the many Experiment Stations throughout the country. The demand from the public for live birds and for settings of eggs was considerably in excess of what the School could supply.

MALAYAN PADI CROP, SEASON 1939 - 1940.

Returns have now been received from all parts of Malaya concerning the areas planted with rice and the crops reaped during the season 1939-1940.

The area of wet padi planted in the season under review was 727,550 acres, and the yield 212,037,000 gantangs of padi, while 65,790 acres were planted with dry-land padi from which 11,165,000 gantangs of padi were reaped. The figures for the 1938-1939 season were:—wet padi 703,740 acres and 218,469,000 gantangs; dry padi 48,850 acres and 8,805,000 gantangs.

While the season was particularly bad in Malacca, Kedah, Selangor and Negri Sembilan, there was a considerable increase in area and crop in Kelantan. It was feared at one time that the Malayan crop would be about 7 per cent. less than in the 1938-1939 season; these final figures, however, show that the decrease in total crop is only 1.8 per cent.

TALKS ON VEGETABLE CULTIVATION IN MALAYA.

Mr. T. D. Marsh, Senior Agriculturist, S.S. and F.M.S., gave a talk on "Vegetable Growing in Malaya" to members of the Selangor Gardening Society on the 7th November, 1940, at the residence of Mr. C. R. Thurstan, Circular Road, Kuala Lumpur.

Mr. C. W. S. Hartley, Agricultural Officer, Province Wellesley and Penang, gave a talk on "How to Grow Foodstuffs" from the Penang wireless station on the 19th November, 1940. A Chinese translation of his talk was given from the same station on the 23rd November, and a Malay version will be broadcast on the 30th November.

THE AGRICULTURAL ADVISORY COMMITTEE.

A meeting of the Agricultural Advisory Committee was held at the Headquarters of the Department of Agriculture, Kuala Lumpur, on the 13th November, 1940, under the chairmanship of the Hon'ble the Adviser on Agriculture, Malay States.

Departmental.

FROM THE DISTRICTS.

*Compiled in the Office of the Chief Field Officer from Monthly Reports of
Agricultural Officers.*

October, 1940.

The Weather.

In most parts of the country the weather has been cool and wet. In Kedah, Penang and Kelantan the total precipitation has been below normal. In Johore the first part of the month was hot and dry but later heavy rain fell.

Crop Reports.

Rubber.—Smoked sheet fetched from \$43 to \$47 per picul. Prices showed a tendency to increase during the month.

Action has been taken for the further control of coagulants containing sulphuric acid. The Federated Malay States and the States of Kedah, Johore and Kelantan have prohibited the importation of sulphuric acid in excessive amounts into their territories and this includes coagulants containing sulphuric acid. In Johore similar action has been taken in regard to hydrochloric acid as well, as this acid was used in some coagulants tested. Thus the stocks of sulphuric acid which have been accumulated in Singapore can no longer be distributed outside the Straits Settlements for use as a coagulant of rubber. Supplies of acetic acid are abundant and there is no likelihood of a shortage occurring again.

In Johore propaganda among small-holders to persuade them to use good quality planting material is yielding results. In Central Johore orders have at present been booked for 7,000 yards to be supplied from the Central Agricultural Station, Ayer Hitam, before the end of March, 1941. T.J.1. is the clone at present most in demand.

Padi.—In Kedah water is now plentiful. The early planted padi has made good growth and looks very promising. Later planted areas do not look so well, due no doubt in part to the use of over-age seedlings and hasty work. In Kelantan the crop at present looks very promising. In north Krian planting has been completed; in the south where planting was begun later, work has been held up by Puasa although supplies of water are ample. In the Panchang Bedena area lack of water held up work but heavy rain fell on the 11th and 13th which enabled planters to recommence cultivation and by the end of the month planting were nearly complete.

How an efficient supply of irrigation water coupled with the construction of efficient bunds will increase the yielding capabilities of a padi area is well borne out by yield figures of Bukit Gantang Padi Test Station in Perak. Between the years 1931 to 1935 this Station, together with the padi area in which it is situated, was irrigated from a temporary dam which was repaired annually, and the water supply was often insufficient in the earlier part of the season or in dry seasons. In 1935 a permanent dam was constructed and a sufficient supply and efficient control of water became possible. In the years 1931 to 1934 the average yield on the Station was 366 gantangs per acre: in the 5 years 1935 to 1940 the average has been 456 gantangs, an average increase of 90 gantangs per acre. A crop of more than 500 gantangs per acre was reaped last season.

Rapid progress is reported to have been made in opening up new padi areas in Selangor. In the Sekinchang area which is being colonized by Chinese, 3,160 acres out of a total of 3,590 acres have already been felled, and out of this area some 1,500 acres will probably be planted this season.

In Malacca the padi crop in inland areas looks very well. The coastal areas are later and growth has been fair except in the Central District where prospects are less hopeful owing to the shortage of water early in the season and the development of acid in the water which has caused damage. This latter problem is under investigation and it would appear that the acidity in the water is due to the drying out of the soil to an unusually great depth during the preceding exceptionally dry season.

Coconuts.—Copra prices have remained very low, and business in this commodity has generally been stagnant. In North Johore it is reported that growers are marketing their copra as they are in need of money and cannot afford to hold back their crop. The same report states that the copra at present coming into the market is of unusually good quality as dealers are refusing to handle a low grade product.

Local oil mills are purchasing larger quantities of copra and this is of some help to coconut growers.

Poultry.—Owing to the difficulty in obtaining supplies of certain ingredients of the standard poultry ration some work has been done in testing the suitability of other rations. One such ration which was recommended for trial at Agricultural Stations was designed to replace the proteins formerly supplied by the imported whale meat meal by substituting groundnut cake meal therefor. The feeding of the ration resulted at least at one Station in a reduction of egg production. When, however, a portion of fish refuse was added to the ration the birds soon regained their normal laying capabilities. It is probable that it would be found that no form of vegetable protein would be a good substitute for animal protein but it can in any case be stated definitely that groundnut cake is a very poor substitute for fish meal. This conclusion is borne out by results obtained in other countries. Work is continuing in order to find a suitable animal protein food; dried fish refuse and blood meal appear to be suitable.

Chuah Settlement, Negri Sembilan.

This Settlement is probably unique in Malaya. It is composed of a compact area of 820 acres fully cultivated and divided into two district settlements, one of about 500 acres occupied by Chinese and the other, 320 acres, by Indians. The whole of the area was originally given out on Temporary Occupation Licences, but many of the settlers have now taken up their land on a permanent title.

The Chinese settlers are principally occupied with pig rearing although recently a considerable number of goats have been introduced. The Indians rear goats and to a lesser extent pigs. It seems that in stock rearing the Chinese have followed the lead of the Indians in keeping goats and the Indians follow the pig-rearing customs of the Chinese. It is estimated that the Settlement maintains some 2,000 to 2,500 pigs and 2,500 goats.

The whole of the area is devoted to the production of food crops for the animals, 90 per cent. of the area being under tapioca.

All the stock is in very good condition and is of a better type than generally met with. The pigs contain a large predominance of Middle-White blood originating from stock obtained from the Central Experiment Station, Serdang.

DEPARTMENTAL NOTES.

Leave.

Dr. T. A. Buckley, Acting Senior Chemist, returned from leave on 2nd November, 1940.

Mr. G. D. P. Olds, Agricultural Officer, has been granted 183 days full-pay leave from 22nd October, 1940, to 22nd April, 1941, inclusive.

Mr. H. D. Meads, Personal Assistant to the Adviser on Agriculture, has been granted 151 days full-pay leave from 3rd November, 1940, to 2nd April, 1941, inclusive. Mrs. S. G. Grant has been appointed to act as Personal Assistant during the absence of Mr. Meads.

FERTILIZER PRICES, NOVEMBER, 1940.

The following are the prices current for the month of November, 1940, of some of the more important fertilizers.

Product.		Analysis				Price per ton \$
		Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
			Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	—	133.00 (short ton)
Muriate of Potash	...	—	—	—	60	200.00
Superphosphate (concentrated)	...	—	39	—	—	140.00
Superphosphate	...	—	16-18	—	—	75.00
Basic Slag	...	—	16*	—	—	75.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	37.00¶
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total

¶ \$35.00 per ton *ex* warehouse, Singapore.

Supplies of calcium cyanamide, sulphate of potash and rock phosphate (Gafsa) are not available.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

Statistical.

MARKET PRICES.

October, 1940.

Major Crops.

Rubber.—There was an improvement in price during the second half of the month, the increase over the month being $1\frac{5}{8}$ cents per lb. In Singapore No. 1. X. Ribbed Smoked Sheet opened at $37\frac{1}{4}$ cents per lb., but fell to $37\frac{1}{8}$ cents; the price then rose steadily to 38 cents on the 12th October and closed at $38\frac{3}{4}$ cents.

The average of daily quotations for the month was 38.01 cents per lb., as compared with 37.55 cents in September. The London average price was 11.80 pence per lb., and New York 20.13 cents gold, as compared with 11.98 pence and 19.13 cents gold in September.

Prices paid for small-holders' rubber at three centres during the month are given in Table 1.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, October, 1940.

(Dollars per picul of 133 $\frac{1}{3}$ lbs.)

Grades	Kuala Kangsar, Perak					Kuala Pilah, Negri Sembilan					Batu Pahat, Johore.				
	2	9	16	23	30	3	10	17	24	31	2	9	16	23	30
Smoked Sheet ...	43.45	44.89	44.95	46.12	—	44.60	—	45.00	47.00	47.00	43.20	43.20	45.34	—	45.48
Unsmoked Sheet ...	40.78	42.00	42.97	43.00	44.00	—	42.00	—	—	—	41.62	40.30	43.00	43.72	43.70
Scrap ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8 per ton.

Transport from Batu Pahat to Singapore by lorry, excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

Palm Oil.—No recent information is available regarding prices paid in the United Kingdom.

Local sales of palm oil in sellers' drums were made in October at the following prices:—bleached oil 5 per cent. f.f.a. \$147.50 and \$130 per ton f.o.b. Port Swettenham; unbleached oil 5 per cent. f.f.a. \$120 per ton f.o.b. Port Swettenham; bleached oil 5 per cent. f.f.a. \$165 per ton c.i.f. Colombo.

Copra.—The sun-dried grade was quoted throughout the month at \$2.50 per picul, and the mixed grade at \$2.25. The September average prices were \$2.39 and \$2.14 per picul respectively.

Coconut oil was sold in Singapore during the month at an average price of \$7 per picul.

Copra cake remained unchanged at \$1.10 per picul.

Rice.—The Singapore average wholesale price for Rangoon Parboiled No. 2 was \$5.83 per picul. There were no dealings in the remaining grades usually quoted in this report.

The July average retail prices in cents per gantang (gallon) of No. 2 Thai rice were: Singapore 31, Penang 33½, and for August 32 and 34½ respectively. Malacca is not quoted.

The average declared trade value of imports during July was \$4.38 per picul, and in August \$4.63.

Padi.—The Government Rice Mills, Perak, are paying a guaranteed price of \$2.50 per picul for padi, plus a bonus of 10 cents per picul for pure strain S.K. 48 padi. The Government Rice Mill, Temerloh, Pahang, continued to pay \$2.25 per picul.

Retail prices of padi in cents per gantang (gallon) were as follows:—Penang and Province Wellesley 13, Perak 12 to 18, Pahang 12 to 22, Malacca 15 to 18, Kelantan 12½.

Pineapples.—Prices of canned pineapples remained unchanged. They are fixed by the Central Board of Pineapple Packers as follows, per case of 48 cans of 1½ lbs. each:—G.A.Q.: Sliced Flat \$4.80, Sliced Tall \$4.95, Cubes \$4.85; Golden: \$5.40, \$5.55 and \$5.45.

Fresh fruit prices were altered during October by the Central Board and are now based on the following table:—

Class of Fruit	Average Weight of 100 Fruit	Price for every 100 Fruit less than Half-Ripe			Premium for every 100 Fruit at least Half-Ripe
		Johore and Klang	Singapore		
			Kranji	Serangoon and Grove Road	
	lbs.	\$	\$	\$	cents
1½ lbs. to 2½ lbs. ...	200	.61	.72	.77	8½
2½ lbs. to 3½ lbs. ...	300	.92	1.08	1.17	17
Over 3½ lbs. ...	400	1.23	1.45	1.56	34½

Beverages.

Tea.—There are no London tea sales.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 15th October, 1940, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.: High Grown Rs. 1.13, Medium Grown 94, Low Grown 80.

Coffee.—Liberian coffee was quoted throughout the month in Singapore at \$14.50 per picul, Excelsa at \$11.50, and Robusta at \$8.50.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$10.10 to \$11.30, and for Sourabaya coffee \$13.25 to \$14.25. The September average prices were \$10.06 to \$11.69 and \$11.62 to \$13.81 respectively.

Spices.

Arccanuts.—The averages of the Singapore Chamber of Commerce quotations per picul, which were stated to be approximate, were:—Best \$6.31, Medium \$5.94, Mixed \$5.50, as compared with \$6.25, \$5.75 and \$5.25 respectively in September.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.95 to \$7.70, Red Whole \$5.75 to \$7.75, Sliced \$11.55 to \$14.80, as compared with \$4.25 to \$7.31, \$4.62 to \$7, and \$8.87 to \$10.81 respectively in September.

Pepper.—Singapore Black continued unchanged at \$6.25 per picul and Muntok White at \$12. The market for Singapore White continued nominal with no quotations.

Nutmegs.—110's were quoted throughout the month at \$20 per picul, as compared with an average price of \$20.50 in September; 80's continued unchanged at \$22.

Penang dried nutmegs were sold at \$19 per picul.

Mace.—Siouw remained a nominal market with no quotations. Nominal quotations for Amboina fell from \$28 to \$27, averaging \$27.75 per picul, as compared with \$33 in September.

Locally produced mace, dry, was sold in Penang at \$45 per picul.

Cloves.—Remained a nominal market with no quotations.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 14th October, 1940, from Rs. 1.30 to Rs. 1.58 per lb.

Miscellaneous.

Derris.—Market conditions in Singapore remained unchanged but there were slight increases in prices quoted. Average prices per picul for the month were as follows:—\$9 to \$10.50 for root sold on a basis of ether extract; \$20 to \$23 for root with 4 to 5 per cent. rotenone content, rising to \$27.50 to \$28.50 for 7 to 9 per cent. rotenone.

Gambier.—Block continued a nominal market with no quotations. No. 1. Cube was quoted throughout the month at \$14 per picul. The September average price was \$14.

Sago.—Pearl fell from \$6 to \$5.60 per picul, averaging \$5.70 as compared with \$6 in September. Flour, Sarawak Fair, rose from \$2.80 to \$3.25 per picul, averaging \$2.99 as compared with \$2.68 in September.

Tapioca.—Flake Fair and Seed Pearl were quoted throughout the month at \$6.50 per picul, and Medium Pearl at \$7.25. September average prices were \$6.62, \$6.62 and \$7.44 respectively.

Tobacco.—Prices of prepared tobacco per picul in Kelantan during October were: 1st quality \$100 to \$170, 2nd quality \$60 to \$135, 3rd quality \$30 to \$115. The range of dried leaf prices was as follows: Kedah 1st quality \$36, 2nd quality \$16; Penang and Province Wellesley \$44 and \$33; Perak Central 1st quality \$37 to \$45, 2nd quality \$25 to \$29, 3rd quality \$13 to 17, cut tobacco \$53; Perak South 1st quality \$45, 2nd quality \$40, 3rd quality \$35, prepared tobacco 70 to 75 cents per kati; Selangor cut tobacco 95 cents to \$1.30 per kati; Pahang 1st quality \$26 to \$45, 2nd quality \$18 to \$35, 3rd quality \$15 to \$25; Malacca \$40.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co., Ltd., Kuala Lumpur, local palm oil prices by Whittall & Co., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at 2s. 4d.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

MALAYAN AGRICULTURAL EXPORTS, AUGUST, 1940.

Product	Net Exports in Tons				
	Year 1939	Jan./Aug. 1939	Jan./Aug. 1940	August 1939	August 1940
Arecanuts ...	38,489	25,114	30,994	3,179	2,734
Coconuts fresh†† ...	97,275†	66,250†	64,635†	6,536†	11,127†
Coconut oil† ...	61,360	39,523	42,851	6,552	4,859
Copra† ...	34,420	34,490	1,706	17,969	4,878*
Copra cake ...	10,707	6,164	4,253	1,505	116*
Gambier, all kinds ...	1,572	1,055	562	168	68
Palm kernels ...	10,774	6,497	5,264	725	135
Palm oil ...	59,712	39,335	36,740	10,920	9,115
Pineapples, canned ...	65,802	60,297	31,765	5,673	816
Rubber¶ ...	361,484¶	218,615¶	349,422¶	28,780¶	40,919¶
Sago,—flour ...	9,583	3,812	667*	67	459*
„ —pearl ...	3,883	2,329	2,475	289	397
„ —raw ...	4,435*	3,204*	4,006*	491*	379*
Tapioca,—flake ...	1,068	575	520	26	65
„ —flour ...	2,706*	1,896*	1,590*	321*	239*
„ —pearl ...	18,277	11,228	10,271	1,485	1,389
Derris ...	1,356	726	818	68	21
†Copra equivalent ...	136,075	100,040	72,632	28,746	3,239

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

MONTH 1940	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,007.6	2,474.0	4,481.6	434.3	497.0	931.3
February ...	1,937.9	1,914.7	3,852.6	411.1	454.0	865.1
March ...	2,081.5	1,877.0	3,958.5	445.3	388.1	833.4
April ...	2,104.3	1,820.7	3,925.0	420.8	370.0	790.8
May ...	2,124.3	2,054.1	4,178.4	414.5	401.0	815.5
June ...	2,128.8	2,696.0	4,824.8	268.6	505.0	773.6
July ...	3,217.7	2,886.4	6,104.1	531.4	529.2	1,060.6
August ...	3,801.2	3,049.9	6,851.1	343.1	389.8	732.9
September ...	3,323.7	2,490.6	5,814.3	296.1	294.0	590.1
Total ...	22,727.0	21,263.4	43,990.4	3,565.2	3,828.1	7,393.3
Total January to September 1939 ...	22,877.2	19,607.8	42,485.0	4,204.9	3,299.1	7,504.0
Total for the year 1939 ...	30,157.7	27,215.0	57,372.7	5,639.3	4,533.1	10,172.4

Stocks on estates as at 30th September, 1940, were:— palm oil 6,769 tons, palm kernels 2,632 tons.

ACREAGES OF TAPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 30TH SEPTEMBER, 1940.

STATE OR TERRITORY (1)	Estimated Acres of Tappable Rubber (9) + (11)	ACREAGES OF TAPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acreage (13)	Percent- age of (13) to (2) (14)
		Acreage (3)	Percent- age of (3) to (2) (4)	Acreage (5)	Percent- age of (5) to (2) (6)								
S.S.—													
Province Wellesley ...	42,220	114	0.2	6,577	15.6	472	1.1	6,691	15.8	35,529	84.2	8,528	20.2
Malacca ...	113,696	302	0.3	13,372	11.7	953	0.8	13,674	12.0	100,022	88.0	20,509	18.0
Penang ...	2,600	nil	nil	735	28.3	35	1.3	735	28.3	1,865	71.7	60	2.3
Singapore ...	30,351	4,181	13.8	5,563	18.3	267	0.9	9,744	32.1	20,607	67.9	3,214	10.6
Total S.S. ...	188,867	4,597	2.4	26,247	13.9	1,727	0.9	30,844	16.3	158,023	83.7	32,311	17.1
F.M.S.—													
Perak ...	277,232	2,268	0.8	31,230	11.3	4,563	1.6	33,498	12.1	243,734	87.9	35,216	12.7
Selangor ...	305,988	4,771	1.5	21,298	7.0	3,715	1.2	26,069	8.5	279,919	91.5	40,859	13.4
Negri Sembilan ...	232,887	2,737	1.1	31,241	12.3	4,614	1.8	33,978	13.4	218,909	86.6	27,911	11.0
Pahang ...	85,147	1,335	1.6	11,269	13.2	4,011	4.7	12,604	14.8	72,543	85.2	5,903	6.9
Total F.M.S. ...	921,254	11,111	1.2	95,038	10.3	16,903	1.8	106,149	11.5	815,105	88.5	109,889	11.9
U.M.S.—													
Johore ...	468,511	7,296	1.5	63,183	13.5	23,903	5.1	70,479	15.0	398,032	85.0	51,494	11.4
Kedah ...	183,642	5,186	2.8	12,317	6.7	4,561	2.5	17,503	9.5	166,139	90.5	32,026	17.4
Kelantan ...	30,569	403	1.3	4,381	14.3	793	2.6	4,784	15.6	25,785	84.4	5,368	17.6
Trengganu (d) ...	4,817	nil	nil	nil	nil	nil	nil	nil	nil	4,817	100.0	1,840	38.2
Perlis (e) ...	1,329	nil	nil	345	26.0	76	5.7	345	26.0	984	74.0	232	17.5
Brunei ...	5,984	nil	nil	1,628	27.2	260	4.3	1,628	27.2	4,356	72.8	874	14.6
Total U.M.S. ...	694,852	12,885	1.8	81,854	11.8	29,593	4.3	94,739	13.6	600,113	86.4	91,834	13.2
Total MALAYA ...	1,804,973	28,593	1.6	203,139	11.2	48,223	2.7	231,732	12.8	1,573,241	87.2	234,034	13.0

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 30th September, 1940.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF SEPTEMBER, 1940, IN DRY TONS

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over			Production by Estates of less than 100 acres estimated 2			Imports				Exports including re-exports				Stocks at end of month			Consumption 3
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1940	Jan. to Sept. 1940	during the month	Jan. to Sept. 1940	January to Sept. 1940		during the month		January to Sept. 1940		Ports	Dealers	Estates acres and over				
									Foreign	Malay States	Foreign	Local	Foreign	Local							
MALAY STATES:—																					
Federated Malay States	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	769
Johore	...	4,649	16,837	15,475	127,739	14,450	79,252	Nil	Nil	Nil	Nil	17,478	9,471	156,232	75,850	...	8,587	15,727	148	...	
Kedah	...	1,870	6,471	7,053	57,396	6,171	47,875	Nil	40	Nil	609	5,192	6,985	34,219	73,293	...	3,102	6,326	...	...	
Perlis	...	331	3,435	30,382	1,825	12,459	Nil	Nil	Nil	Nil	Nil	1,768	3,543	17,971	28,619	...	375	3,279	...	...	
Kelantan	...	31	26	16	141	30	280	Nil	Nil	Nil	Nil	Nil	46	Nil	428	...	37	20	...	...	
Trengganu	...	370	465	464	3,692	719	8,303	Nil	Nil	Nil	Nil	371	896	1,705	10,542	...	311	440	...	...	
Brunei	...	48	160	192	1,637	493	3,248	Nil	Nil	Nil	Nil	5	681	25	4,971	...	77	130	...	...	
Total Malay States	...	7,317	27,494	26,838	221,545	23,753	152,360	Nil	40	Nil	609	24,814	21,818	189,452	195,063	...	12,698	25,964	148	769	
S. SETTLEMENTS:—																					
Malacca	...	1,661	1,323	1,562	11,973	872	7,455	Nil	Nil	Nil	Nil	3,245	...	24,805	...	...	1,986	1,424	...	...	
Province Wellesley	...	1,158	675	581	4,688	319	2,944	Nil	...	Nil	188,449	11,205	...	86,642	...	...	1,719	659	...	...	
Penang	...	2,739	4,188	16	24	197	143	983	23,644	22,790	...	39,225	...	276,829	...	2,428	3,437	12	...	...	
Singapore	...	15,190	18,308	284	174	1,471	107	663	17,734	163,489	...	Nil	...	Nil	...	5,659	17,545	247	24	168	
Labuan	...	...	22	Nil	Nil	18	134	68	...	531	...	...	...	...	...	...	21	...	...	...	
Total Straits Settlements	...	17,929	25,337	2,298	2,341	18,329	1,459	11,579	19,792	23,644	188,449	53,675	...	391,276	...	8,087	24,708	2,342	24	168	
Total Malaya	...	17,929	32,634	29,792	29,179	239,874	25,212	163,939	19,792	23,684	186,810	78,489	21,818	586,728	195,063	8,087	37,406	28,306	172	937	

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Fede- rated Malay States	S'ore	Penang	P.W'e'ly M'cca, Labuan & Brunei	Johore	Kedah
	23	24	25	26	27	28
DRY RUBBER	7,546	16,163	2,002	3,208	2,154	269
WET RUBBER	1,041	1,382	435	527	948	306
Total	8,587	17,545	3,437	3,735	3,101	575

Notes:—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e., Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] - [2] - [3] - [4] - [5] - [9] - [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15½ wet sheet, 25% scrap, lump, etc., 40% stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S. S. and F. M. S., at Singapore on 24th October 1940.

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Sept. 1940
	30	31
Singapore	53,231	402,237
Penang	15,263	117,819
Port Swettenham.	9,888	59,272
Malacca	107	1,400
TOTAL	78,489	580,738

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Sept. 1940
	33	34
Malay States	46,556	384,575
Straits Settlements	3,407	30,023
MALAYA	49,963	413,598

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT					EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.						
	Means of		Absolute Extremes.			At 1 foot	At 4 feet	Total.		Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.			
			Max.	Min.	Lowest						Highest	Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm				Fog morning obs.	Gale force 8 or more	
	A.	B.	Min.	°F	°F	°F	°F	°F	in.	mm.	in.	mm.	Amt.	in.	hrs.	hrs.	Per cent.			
Kuala Lumpur Aerodrome Selangor	89.0	72.6	80.8	96	70	78	75	84.3	85.2	5.41	137.4	1.90	17	12	3	4	—	152.15	5.07	42
Port Swettenham Aero- drome, Selangor	88.4	72.5	80.5	92	70	78	75	85.4	85.9	7.28	184.9	2.16	12	12	6	—	—	159.75	5.33	44
Sitiawan, Perak	88.6	73.1	80.9	91	71	83	75	83.6	85.1	5.54	140.7	1.37	14	12	1	—	—	164.85	5.49	45
Ipoh Aerodrome, Perak	89.4	72.2	80.8	92	69	79	75	83.2	84.6	5.82	147.8	1.22	22	18	2	—	1	168.70	5.62	46
Temerloh, Pahang	90.2	72.8	81.5	94	71	81	75	86.0	86.9	3.84	97.5	0.85	14	12	4	16	—	161.15	5.37	44
Kuala Lipis, Pahang	88.8	72.1	80.5	92	70	85	74	83.8	85.1	6.88	174.8	2.11	14	14	1	27	—	153.40	5.11	42
Kuala Pahang, Pahang	87.1	74.2	80.7	91	72	84	76	86.7	87.8	4.21	106.9	2.40	15	10	4	—	2	221.15	7.37	61
Kallang Aerodrome, S'pore	85.9	76.0	80.9	88	71	80	80	82.7	83.9	5.78	146.8	1.72	14	11	1	—	—	190.05	6.33	52
Bayan Lepas Aerodrome Penang	86.1	74.1	80.1	89	72	81	76	83.2	84.8	20.71	526.0	5.08	23	21	4	—	—	161.45	5.38	45
Malacca Town, Malacca	84.8	73.9	79.3	87	72	77	77	83.9	84.8	4.77	121.2	1.97	13	11	1	—	1	189.20	6.31	52
Kluang, Johore	88.2	70.8	79.5	91	69	84	73	81.7	82.5	7.81	198.4	2.18	19	16	6	12	1	165.05	5.50	45
Mersing, Johore	87.3	71.9	79.6	90	70	83	74	82.4	82.9	4.59	116.6	2.52	13	12	4	—	—	185.15	6.17	51
Alor Star, Kedah	86.7	73.7	80.2	89	71	78	75	84.8	85.7	10.71	272.0	2.25	23	21	—	1	2	181.55	6.05	50
Kota Bharu, Kelantan	89.6	73.3	81.5	93	70	86	76	85.5	85.9	6.04	153.4	1.21	21	14	3	—	1	210.85	7.03	57
Kuala Trengganu, Trengganu	87.8	72.8	80.3	90	71	85	75	83.1	85.5	11.54	293.1	2.43	19	15	3	1	2	195.05	6.50	54
Labuan	87.5	76.8	82.1	92	72	81	81	85.8	87.1	10.68	271.3	3.53	15	11	1	—	—	206.20	6.87	57
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	74.6	62.5	68.5	79	59	66	64	71.7	72.2	4.70	119.4	0.80	17	17	1	14	3	126.50	4.22	35
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	71.7	57.2	64.5	76	53	67	62	70.8	70.5	10.27	260.9	1.47	27	25	—	2	3	105.35	3.51	29
Cameron Highlands, Rhodo- dendron Hill, Pahang 5120 ft.	70.8	59.4	65.1	75	58	65	61	*	*	10.53	267.5	1.72	24	22	—	—	3	118.20	3.94	33

* Not recorded.

